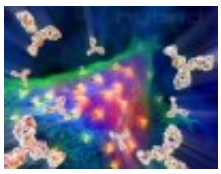
Breast Milk and Antibodies



Antibodies, or immunoglobulins, are found in breast milk. There are five basic forms: IgG, IgA, IgM, IgD and IgE. All 5 forms have been found in human breast milk, but the most prevalent type is IgA, also known as secretory IgA. It is also found in large amounts throughout the intestinal tract and respiratory system of adults. Two joined

IgA antibodies protect the antibody molecules from being reduced by gastric acid and digestive enzymes present in the intestinal tract and stomach.

It takes several weeks or even months after birth for infants to make secretory IgA on their own. Through breast milk, secretory IgA molecules are passed on to the nursing baby and help in many ways beyond their natural ability to bind to microorganisms and keep them away from the body's tissues. Bottle-fed infants do not have the advantage of fighting ingested pathogens until they can produce secretory IgA on their own.

The medical establishment know that infants who are breastfed contract fewer infections than formula-fed babies. Breast milk protects against E. coli, salmonellae, shigellae, streptococci, staphylococci, pneumococci, poliovirus, and rotaviruses. It is known that infants who receive formula can contract more sickness, meningitis, infections of the intestinal tract, ear, respiratory tract and urinary tract than do breastfed babies.

Antibodies transmitted to an infant are targeted against germs in the baby's surroundings. A mother will begin producing antibodies when she comes in contact with a disease-causing agent. Antibodies made by the Mother are specific to her environment. The baby will then receive

protection from infectious germs it will encounter the most in the first few weeks of life. Antibodies passed to the baby will disregard the useful bacteria found in the gut. This gut flora is used to get rid of the growth of harmful organisms, which will provide another measure of resistance. Secretory IgA molecules, unlike other antibodies, ward off diseases without causing inflammation.

Several other molecules in human milk prevent microbes from attaching to mucosal surfaces. Oligosaccharides, which are simple chains of sugars, can intercept bacteria, forming harmless complexes that the baby excretes. Breast milk also contains mucins that contain protein and carbohydrate. They are also capable of attaching to bacteria and viruses and eliminating them from the body.

There are other helpful molecules present in breast milk. A molecule of a protein called lactoferrin, can bind to two atoms of iron. Since many pathogenic bacteria thrive on iron, lactoferrin can stop their spread. It is especially effective at reducing or slowing down the proliferation of organisms that can cause serious illness in infants such as Staphylococcus aureus. One of the oldest disease-resistance factors known in breast milk is the Bifidus factor, which promotes the growth of a beneficial organism called Lactobacillus bifidus. Interferon, which is found in colostrum that a mother produces during the first few days after birth, can be thought of as an antiviral agent. Fibronectin which is present in colostrum, can minimize inflammation and aid in repairing tissue damage. Colostrum is a natural and 100% safe vaccine since it contains large quantities of secretory immunoglobulin A, or IgA.

Immune cells are also in abundance in breast milk. They consist of white blood cells, which fight infection and activate other defenses. Cells such as neutrophils act as phagocytes in the infant's intestinal tract for about 2 months after birth. Macrophages are present in about 40 percent of all the leukocytes in colostrum. In some experiments they have shown they are better capable than are their counterparts in blood. Macrophages in breastmilk also manufacture lysozyme, which increases the amount in the

infant's gastrointestinal tract. An enzyme called Lysozyme destroys bacteria by disrupting their cell walls. Macrophages in the digestive tract can get lymphocytes to action against invaders. B lymphocytes raise antibodies and T lymphocytes kill infected cells directly or provide direction to other chemical messages that will mobilize other components of the immune system. Breast milk lymphocytes proliferate in the presence of Escherichia coli, which is a bacterium that can cause severe illness in babies. However, they are less responsive than blood lymphocytes to germs. Breast milk lymphocytes also produce gamma interferon, migration inhibition factor, and monocyte chemotactic factor. All of which can strengthen the immune response.

There are studies showing that breast milk may induce an infant's immune system to mature more quickly. Breastfed babies produce higher levels of antibodies in response to immunizations. Certain hormones in milk like cortisol and proteins such as epidermal growth factor, nerve growth factor, an insulin-like growth factor, and somatomedin C, can close up the leaky mucosal lining of the newborn. This makes it impossible for harmful pathogens to get though. Other compounds in breast milk stimulate a baby's own production of secretory IgA, lactoferrin and lysozyme but are not known. Secretory IgA, lactoferrin and lysozyme are all found in the urine of breastfed babies. Breastfed babies cannot absorb these molecules from breast milk into their intestinal tract. The molecules are produced in the mucosa of the baby's urinary tract. Therefore, breastfed babies have a lower risk of acquiring urinary tract infections.

Breast milk has the ability to protect infants against infection until they can protect themselves, along with providing them with all the nutritional requirements they need. Immune protection continues to improve and change dependent upon the needs of the infant and age throughout the duration of breastfeeding no matter how long that may be. A baby may not necessarily receive enough of their mother's IgG immunities through breast milk to qualify as an immunization against a particular disease, but IgA, certain fatty acids, etc, in the breast milk active and do protect

against illnesses.

Dr. Jack Newman in How Breast Milk Protects Newborns, states: "Free fatty acids present in milk can damage the membranes of enveloped viruses, such as the chicken pox virus, which are packets of genetic material encased in protein shells." The secretory IgA in breast milk also activates against the chicken pox virus in vitro.

As the baby grows, some of the immune factors in breast milk increase in concentration so older babies still receive plenty of immune factors. As a baby starts to nurse less and milk supply decreases, the concentration of immunities increases. [source: Goldman AS et al. "Immunologic components in human milk during weaning." Acta Paediatr Scand. 1983 Jan;72(1):133-4.]

List of Immune Factors In breast milk:

alpha-Lactalbumin (variant)
alpha-lactoglobulin
alpha2-macroglobulin (like)
ß-defensin-1
Bifidobacterium bifidum
Carbohydrate
Casein
CCL28 (CC-chemokine)
Chondroitin sulphate (-like)
Complement C1-C9
Folate
Free secretory component
Fucosylated oligosaccharides
Gangliosides GM1-3, GD1a, GT1b, GQ1b
Glycolipid Gb3, Gb
Glycopeptides
Glycoproteins (mannosylated)
Glycoproteins (receptor-like)

Glycoproteins (sialic acid-containing or terminal galactose)
Haemagglutinin inhibitors
Heparin
IgG
IgM
IgD
kappa-Casein
Lactadherin (mucin-associated glycoprotein)
lactoferrin
Lactoperoxidase
Lewis antigens
Lipids
Lysozyme
Milk cells (macrophages, neutrophils, B & T lymphocytes)
Mucin (muc-1; milk fat globulin membrane)
Nonimmunoglobulin macromolecules (milk fat, proteins)
Oligosaccharides
Phosphatidylethanolamine
(Tri to penta) phosphorylated beta-casein
Prostaglandins E1, E2, F2 alpha
RANTES (CC-chemokine)
Ribonuclease
Secretory IgA
Secretory leukocyte protease inhibitor (antileukocyte protease; SLPI)
Sialic acid-glycoproteins
sialylated oligosaccharides
Sialyllactose
Sialyloligosaccharides on sIgA(Fc)
Soluble bacterial pattern recognition receptor CD14
Soluble intracellular adhesion molecule 1 (ICAM-1)
Soluble vascular cell adhesion molecule 1 (VCAM-1)
Sulphatide (sulphogalactosylceramide)
Trypsin inhibitor
Vitamin A
vitamin B12

Xanthine oxidase (with added hypoxanthine)
Zinc
Unidentified factors